

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.					
1. REPORT DATE (DD-MM-YYYY) 4-2012		2. REPORT TYPE Final		3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE Science and Technology for Communication and Persuasion Abroad: Gap Analysis and Survey				5a. CONTRACT NUMBER N00014-11-D-0323	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER N/A	
6. AUTHOR(S) McCants, William				5d. PROJECT NUMBER N/A	
				5e. TASK NUMBER A42100	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Center for Naval Analyses 4825 Mark Center Drive Alexandria, VA 22311-1850				8. PERFORMING ORGANIZATION REPORT NUMBER DIM-2012-U-000405-2Rev	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Director Emerging Capabilities Division Rapid Reaction Technology Office 8724 John J. Kingman Road Fort Belvoir, VA 22060-6218				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution Unlimited.					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT The Department of Defense's Rapid Reaction Technology Office (RRTTO) issued a "Strategic Communication Science and Technology Plan" in 2009 that surveyed the government's programs in this area and their gaps. To keep abreast of the latest technological developments, this report is being updated for FY 2012. The updated report discusses domains for future investment in research and development (R&D); identifies gaps and proposes new science and technology (S&T) initiatives; and surveys current S&T programs. The updated report finds that there has not been adequate investment in the technological gaps identified by RRTTO in 2009. Furthermore, the U.S. government has made limited R&D investments in using social interaction technology, persuasive technology, and immersive virtual environments and simulation games for communication and persuasion—areas of R&D not discussed at length in RRTTO's 2009 report. CNA reached this conclusion after surveying current U.S. government programs, reviewing recent academic literature on technology for communication and persuasion, and consulting with experts inside and outside the U.S. government. Based on its analysis of these gaps, CNA has identified several areas for investment, particularly in the digital realm.					
15. SUBJECT TERMS Technology, Strategic Communication, Survey, Gap Analysis, RRTTO, Rapid Reaction Technology Office					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT SAR	18. NUMBER OF PAGES 36	19a. NAME OF RESPONSIBLE PERSON Knowledge Center/Robert Richards
a. REPORT U	b. ABSTRACT U	c. THIS PAGE U			19b. TELEPHONE NUMBER (include area code) 703-824-2104

20120515308

Science and Technology for Communication and Persuasion Abroad

Gap Analysis and Survey

William McCants

Commissioned by the U.S. Department of Defense's
Rapid Reaction Technology Office,
Emerging Capabilities Division

DIM-2012-U-000405-2REV
March 2012

Strategic Studies is a division of CNA. This directorate conducts analyses of security policy, regional analyses, studies of political-military issues, and strategy and force assessments. CNA Strategic Studies is part of the global community of strategic studies institutes and in fact collaborates with many of them.

On the ground experience is a hallmark of our regional work. Our specialists combine in-country experience, language skills, and the use of local primary-source data to produce empirically based work. All of our analysts have advanced degrees, and virtually all have lived and worked abroad.

Similarly, our strategists and military/naval operations experts have either active duty experience or have served as field analysts with operating Navy and Marine Corps commands. They are skilled at anticipating the "problem after next" as well as determining measures of effectiveness to assess ongoing initiatives. A particular strength is bringing empirical methods to the evaluation of peace-time engagement and shaping activities.

The Strategic Studies Division's charter is global. In particular, our analysts have proven expertise in the following areas:

- The full range of Asian security issues
- The full range of Middle East related security issues, especially Iran and the Arabian Gulf
- Maritime strategy
- Insurgency and stabilization
- Future national security environment and forces
- European security issues, especially the Mediterranean littoral
- West Africa, especially the Gulf of Guinea
- Latin America
- The world's most important navies
- Deterrence, arms control, missile defense and WMD proliferation

The Strategic Studies Division is led by Dr. Eric V. Thompson, who is available at 703-824-2243 or thompson@cna.org. The executive assistant to the director is Ms. Rebecca Martin, at 703-824-2604.

Approved for distribution:

March 2012



Ken E. Gause, Acting Research Team Leader
International Affairs Group
Center for Strategic Studies

This document represents the best opinion of CNA at the time of issue.
It does not necessarily represent the opinion of the Department of the Navy.

Cleared for Public Release. Specific authority: N00014-11-D-0323.
Copies of this document can be obtained through the Defense Technical Information Center at www.dtic.mil or contact CNA Document Control and Distribution Section at 703-824-2123.

Copyright © 2012 CNA

This work was created in the performance of Federal Government Contract Number N00014-11-D-0323. Any copyright in this work is subject to the Government's Unlimited Rights license as defined in DFARS 252.227-7013 and/or DFARS 252.227-7014. The reproduction of this work for commercial purposes is strictly prohibited. Nongovernmental users may copy and distribute this document in any medium, either commercially or noncommercially, provided that this copyright notice is reproduced in all copies. Nongovernmental users may not use technical measures to obstruct or control the reading or further copying of the copies they make or distribute. Nongovernmental users may not accept compensation of any manner in exchange for copies. All other rights reserved.

Contents

Executive summary	iii
Introduction	1
Digital domains for research and development.....	3
Social interaction technology	3
Persuasive technology	5
Immersive virtual environments and simulation games.....	7
Identified gaps and proposed S&T activities for communication and persuasion	9
Survey and validation of theories and techniques for influence in the digital realm	9
Target audience analysis, trend monitoring, and source criticism.....	9
Online measures of effectiveness	10
Training in techniques of communication and persuasion in the digital realm.....	10
Immersive virtual environments and simulation games for non-military purposes.....	11
Persuasive technology on mobile devices for encouraging positive behavior	11
Crowdsourcing for problem solving and accountability	11
Studying adversary use of social media	12
Technology for promoting freedom under repressive regimes	12
Expanding investment in emerging technologies	12
Appendix: Survey of Current Programs.....	15

Executive summary

Over the last 10 years, the U.S. government has made significant investments in science and technology in order to enhance its ability to understand and shape public opinion and behavior abroad—a domain of activity referred to in this report as “shaping,” “influencing,” or “communication and persuasion.” Because this effort is taking place across a vast government bureaucracy, the policy-makers and practitioners engaged in communication and persuasion do not always know what tools are at their disposal and what tools need to be invented.

To address this problem, the Department of Defense’s Rapid Reaction Technology Office (RRTO) issued a “Strategic Communication Science and Technology Plan” in 2009 that surveyed the government’s programs in this area and their gaps. To keep abreast of the latest technological developments, RRTO commissioned CNA to update this report for FY 2012. The updated report discusses domains for future investment in research and development (R&D); identifies gaps and proposes new science and technology (S&T) initiatives; and surveys current S&T programs.

There has not been adequate investment in the technological gaps identified by RRTO in 2009. Furthermore, the U.S. government has made limited R&D investments in using social interaction technology, persuasive technology, and immersive virtual environments and simulation games for communication and persuasion—areas of R&D not discussed at length in RRTO’s 2009 report. CNA reached this conclusion after surveying current U.S. government programs, reviewing recent academic literature on technology for communication and persuasion, and consulting with experts inside and outside the U.S. government. Based on an analysis of these gaps, we have identified the following areas for investment:

- Survey and validation of theories and techniques for influence in the digital realm
- Target audience analysis, trend monitoring, and source criticism
- Online measures of effectiveness
- Training in techniques of communication and persuasion in the digital realm

- Immersive virtual environments and simulation games for non-military purposes
- Persuasive technology on mobile devices for encouraging positive behavior
- Crowdsourcing for problem solving and accountability
- Studying adversary use of social media
- Technology for promoting freedom under repressive regimes
- Expanding investment in emerging technologies

Although these development, research, and training gaps have been listed separately, they are interdependent, as are the three technologies highlighted below: social interaction technology, persuasive technology, and immersive virtual environments and simulation games. Indeed, as the technologies converge on one another, it will become more difficult to speak of different domains of technological research and development for communication and persuasion.

As communication becomes more digital (i.e., mediated by computers), more interactive (enhancing an individual's influence), and more mobile, those who understand the new communication environment and know how to use it effectively will have more influence than those who do not. Audience analysis is not enough. Therefore, this report recommends conducting research on effective techniques for cultivating relationships and influencing people in the digital realm, as well as investing in new technologies to deploy them.

Despite the focus of this report on technology for communication and persuasion, such technology will only succeed in advancing U.S. interests if it serves well-informed policies; if the senior makers of those policies use and understand the technologies themselves; and if the practitioners carrying out those policies remember that putting a human face on an institution's words and actions and establishing positive relationships—on and offline—with people working toward shared goals matter more than the substance of any particular message.

Introduction

Over the last 10 years, the U.S. government has made significant investments in science and technology in order to enhance its ability to understand and shape public opinion and behavior abroad—a domain of activity referred to in this report as “shaping,” “influencing,” or “communication and persuasion.” Because this effort is taking place across a vast government bureaucracy, the policy-makers and practitioners engaged in communication and persuasion do not always know what tools are at their disposal and what tools need to be invented. Further complicating this landscape is the fact that different agencies have different roles and responsibilities for understanding and engaging with foreign populations. Nevertheless, many of the same tools could enhance those agencies’ capabilities if there were better awareness of them across the government.

To address this problem, the Department of Defense’s Rapid Reaction Technology Office (RRTO) issued a “Strategic Communication Science and Technology Plan” in 2009 that emphasized fostering positive relationships with foreign publics to further America’s national security. Many of its recommendations were process oriented, including greater coordination of U.S. government messaging; routine training for communication professionals; and a broader communication framework than the current one, which is used primarily to counter violent extremism and monitor Middle Eastern affairs.

Those recommendations still stand and were reinforced in the House Armed Services Committee (HASC) report on the National Defense Authorization Act for FY 2012, which calls for “technical capabilities to respond in a systemic, rapid, sustained and measurable way to the constant barrage of narratives being used to undermine our military and security efforts.” The HASC report also appeals for technologies “to rapidly analyze and respond to adversarial narratives in the information environment.”

To keep abreast of the latest developments in science and technology for understanding and shaping foreign audiences, RRTO has commissioned CNA to update its 2009 report by surveying the programs of the relevant U.S. government agencies and identifying gaps in current capabilities. CNA finds that there has not been adequate investment in the technological gaps identified by RRTO. Furthermore, the U.S. government has made limited R&D investments in using social interaction technology, persuasive technology, and immersive virtual environments and simulation games for communication and persuasion—areas not discussed at length in RRTO’s 2009 report. CNA reached this

conclusion after conducting a survey of current U.S. governments programs, reviewing recent academic literature on technology for communication and persuasion, and consulting with experts inside and outside the U.S. government.

Some of the specific science and technology gaps identified by RRTO's 2009 report included:

- semantic analysis to identify themes in online media and track the popularity of U.S. policy;
- a space-based radio transmitter;
- better access to the Internet and social media over cell phones in developing countries;
- better machine translation, storage, and retrieval capabilities;
- mobile printing powered by solar or other alternative means; and
- quantitative assessment of communication and influence activities

Since 2009, U.S. government agencies have funded research and development in semantic analysis of social media¹ and machine translation.² Much more investment in these and the other technologies identified in the 2009 report is critical, given their importance in shaping foreign opinion.

Equally important is conducting research on effective techniques for cultivating relationships and influencing people in the digital realm. It is not enough to know one's audience and use the latest technology to reach them. Different digital media favor different techniques of influence. In comparison with Facebook, for example, connections established on Twitter are more serendipitous since its design allows messages to be seen and repeated by people unknown to the original author. The differences between digital media should be studied, validated, learned, and exploited to achieve the desired effects.

¹ See IARPA's "Open Source Indicators Program" (Solicitation #: IARPA-BAA-11-11) and DARPA's "Social Media in Strategic Communication" (Solicitation #: DARPA-BAA-11-64).

² See IARPA's "Babel Program" (Solicitation #: IARPA-BAA-11-02).

Digital domains for research and development

Based on a survey of current U.S. programs, a review of the relevant academic literature on technology for communication and persuasion, and consultation with experts inside and outside government, the following three areas should receive increased research and development: social interaction technology, persuasive technology, and immersive virtual environments and simulation games.

Social interaction technology

Of increasing importance for communication and persuasion are social interaction technologies, many of which are referred to as “social media”—a many-to-many form of computer-mediated communication.³ According to a study published at the same time as RRTO’s report in 2009, over half of all Internet users are members of an online social network.⁴ That proportion has surely expanded over the last three years, with the rapid growth of sites such as Facebook and Twitter and the spread of mobile devices.⁵ Particularly in developing countries, mobile devices are quickly becoming one of the primary means of accessing information and communication applications online.⁶ As communication becomes more digital (i.e., mediated by computers), more interactive (enhancing an individual’s influence), and more mobile, those who understand the new

³ Brian G. Smith, “Socially Distributing Public Relations: Twitter, Haiti, and Interactivity in Social Media,” *Public Relations Review* 36 (2010), 329.

⁴ Donald K. Wright and Michelle D. Hinson, “An Updated Look at the Impact of Social Media on Public Relations Practice,” *Public Relations Journal* 3 (2009): 2.

⁵ As of January 13, 2012, Facebook alone had more than 800 million active users, who uploaded more than 250 million photos per day (see www.facebook.com/press/info.php?statistics).

⁶ Peter Meso, Philip Musa, and Victor Mbarika, “Towards a Model of Consumer Use of Mobile Information and Communication Technology in LDCs: The Case of sub-Saharan Africa,” *Information Systems Journal* 15 (2005): 137.

communication environment and know how to use it effectively will have more influence than those who do not.⁷

Although there was a dearth of literature about online influence in interactive environments a few years ago, that has started to change, at least in the social sciences.⁸ But even now, the literature is not synthesized in ways that are useful for the U.S. government. Research gaps identified by academics include the ways that online interactivity affects beliefs and behaviors differently from the physical world;⁹ the impact of gender on such interactions;¹⁰ the ways that different communication modalities favor different strategies of influence;¹¹ social media users' reasons for aligning themselves with an organization and creating content that serves the organization's PR objectives;¹² new metrics for measuring messaging;¹³ how people gather and share information online;¹⁴ and ways that public relations practitioners and senior executives become more valuable and accessible to different audiences.¹⁵ Scholars of online influence have noted that most studies look at the interactions of strangers, even though most interactions of people online are between those who know, or want to know, one another.¹⁶ Researchers have

⁷ Wright and Hinson, "An Updated Look," 3.

⁸ In 2005, Rosanna Guadagno and Robert Cialdini noted the dearth of academic literature on persuasion and social media. See their "Online Persuasion and Compliance: Social Influence on the Internet and Beyond.pdf," in *The Social Net: The Social Psychology of the Internet*, ed. by Yair Amichai-Hamburger (New York: Oxford University Press, 2005), 109.

⁹ Guadagno and Cialdini, "Online Persuasion and Compliance," 110.

¹⁰ Ibid.

¹¹ Ibid., 111.

¹² Smith, "Socially Distributing Public Relations," 333-4.

¹³ Ibid., 334.

¹⁴ Wright and Hinson, "An Updated Look," 4.

¹⁵ On increasing the accessibility and value of public relations professionals in the eyes of journalists, see Smith, "Socially Distributing Public Relations," 334; Richard D. Waters, Natalie T. J. Tindall, and Timothy S. Morton, "Media Catching and the Journalist-Public Relations Practitioner Relationship: How Social Media Are Changing the Practice of Media Relations," *Journal of Public Relations* 22, issue 3 (2010): 243-5, 260-1.

¹⁶ Guadagno and Cialdini, "Online Persuasion and Compliance," 110.

also noted that there is a preference for studying text-based communication as opposed to interaction in immersive virtual environments.¹⁷

Public relations professionals also fund research on online influence in interactive environments, but it pertains mostly to their specific organizations. The questions that primarily interest them are how much social media communication there is about their organization; what is being said; what impact that information has on their key audiences; and how the information is affecting attitudes and behavior regarding their organization.¹⁸ The U.S. government could ask the same questions of its agencies, particularly those with a more public profile abroad.

Most theories of online influence in interactive environments are based on qualitative research. Such research is a necessary first step to understanding the digital environment but it is not often followed by quantitative testing and validation, for which the data-rich Internet is ideally suited. For example, a time-honored theory of influence holds that certain individuals, or “influentials,” mediate messages between institutions and individuals, and are thus responsible for sparking major social changes. Recent research has found that in most circumstances, this is the exception rather than the rule.¹⁹ This kind of theory validation research can keep the government from wasting millions of dollars and much effort on technologies and messaging strategies derived from unsound or outmoded theories of communication and influence. It also lays the groundwork for developing credible measures of effectiveness for influence activities, both online and off—an area where the U.S. government often falls short.

Persuasive technology

Another area for prospective investment is persuasive technology—computing systems that are specifically designed to bring about a change in attitudes or behaviors.²⁰ Most of the research in this area focuses on health, social issue awareness, marketing,

¹⁷ Ibid., 111.

¹⁸ Wright and Hinson, “An Updated Look,” 18.

¹⁹ Duncan Watts and Peter Sheridan Dodds, “Influentials, Networks, and Public Opinion Formation,” *Journal of Consumer Research* 34, no. 4 (December 2007): 441-458.

²⁰ B. J. Fogg, *Persuasive Technology: Using Computers to Change What We Think and Do* (Morgan Kaufmann Publishers, 2003), 32.

occupational improvements, and creating empathy.²¹ For example, private companies are developing fitness software on mobile phones that uses goal-setting techniques to encourage physical activity.²² The theoretical frameworks in the field of persuasive technology are heavily influenced by studying technology use in the West—which, some argue, biases the field toward individualist rather than collectivist motives for action.²³

Although the U.S. government has had success in developing this kind of technology to increase recruitment in the military,²⁴ it has not invested heavily in using the technology to foster skills that highly correlate with peaceful outcomes, such as empathy and conflict resolution skills.²⁵ Admittedly, there are few examples of such technology and there is little research on the durability of their short-term positive outcomes. Nevertheless, studies of persuasive technologies, particularly games, have found that they are effective at disseminating messages, which is why they have increasingly become part of marketing campaigns.²⁶ It might be worthwhile to invest in research on the persuasiveness of so-called serious games, particularly for non-Western cultures, and to develop new technologies to that end. Such investment should include immersive virtual environments, which favor different strategies of influence than text-based environments.²⁷

²¹ Rilla Khaled, "Culturally-Relevant Persuasive Technology" (Dissertation, Victoria University of Wellington, 2008), 11.

²² S. Consolvo, P. Klasnja, D. W. McDonald, and J. A. Landay, "Goal-setting considerations for persuasive technologies that encourage physical activity," *Proceedings of the 4th International Conference on Persuasive Technology* Persuasive 09 (2009).

²³ Rilla Khaled, Pippin Barr, Ronald Fischer, James Noble, and Robert Biddle, "Factoring Culture into the Design of a Persuasive Game," *Journal of Consumer Research*, 2006: 213-14.

²⁴ David B. Nieborg, "America's Army: More Than a Game," *Bridging the Gap: Transforming Knowledge into Action through Gaming and Simulation* (Munich: Ludwig Maximilians University, 2004), CD-ROM; Terry Lavender, "Games Just Wanna Have Fun ... Or Do They? Measuring The Effectiveness of Persuasive Games," *Loading 1*, no. 1 (2007).

²⁵ George Veletsianos and Annita Eliadou, "Conceptualizing the Use of Technology to Foster Peace via Adventure Learning," *The Internet and Higher Education* 12 (2009).

²⁶ *Ibid.*, 16.

²⁷ Guadagno and Cialdini, "Online Persuasion and Compliance," 111. The U.S. government has started to invest in the development of serious games for training intelligence analysts (see IARPA's "Sirius Program" (Solicitation #: IARPA-BAA-11-03)).

Immersive virtual environments and simulation games

The persuasive power of immersive virtual environments derives from their ability to completely surround the senses of users. In studies of human interactions in virtual environments, for example, researchers found that the persuasiveness of a digital representation of a user—an avatar—grew as it became more lifelike. This was even the case when the avatar was controlled by a computer. Similarly, studies found that the effect of violent videos was heightened in an immersive environment.²⁸

The U.S. military is advanced in its development of immersive technology and simulation games, particularly for training purposes. Indeed, the U.S. military is so proficient in creating immersive virtual environments²⁹ it could use that proficiency and its gaming capabilities³⁰ to build ties to non-military institutions. For example, the U.S. military might offer the NGO (non-governmental organization) community assistance with training exercises, crisis simulations, and so forth. Such assistance would foster positive attitudes toward the military, better acquaint the military with NGO needs and dynamics, and prepare both parties to cope with sudden crises.

The ultimate utility of these areas of research and development will be determined by how well they meet the requirements of policy-makers and practitioners engaged in communication and persuasion. But unless the government invests in new areas of research and technology and knows how to use the tools it already possesses, the

²⁸ J. M. Loomis, J. J. Blascovich, and A. C. Beall, "Immersive virtual environment technology as a basic research tool in psychology," *Behavior Research Methods, Instruments, & Computers: A Journal of the Psychonomic Society, Inc* 31.4 (1999): 557-64; Rosanna E. Guadagno, J. I. M. Blascovich, and Jeremy N. Bailenson. "Virtual Humans and Persuasion : The Effects of Agency and Behavioral Realism," *Media Psychology* 10.1 (2007): 1-22; Susan Persky and Jim Blascovich, "Immersive Virtual Environments Versus Traditional Platforms: Effects of Violent and Nonviolent Video Game Play," *Media Psychology* 10.1 (2007): 135-156.

²⁹ For example, see the U.S. Army's recent effort to hold a force protection exercise in an entirely virtual environment, at:
(http://www.army.mil/article/71379/European_garrisons_protecting_Army_communities_with_virtual_training/).

³⁰ For example, see UrbanSim (http://ict.usc.edu/media/overviews/UrbanSim_Overview.pdf), Elusive Victory (<http://www.decisive-point.com/portfolio/elusivevictory.html>), and MMOWGLI (<http://portal.mmowgli.nps.edu/>). For an overview of these types of games, see PAXsims (paxsims.wordpress.com) and Michael Peck, "Confessions of an Xbox General," *Foreign Policy*, Sep. 28, 2011 (http://www.foreignpolicy.com/articles/2011/09/28/Xbox_general?page=0,0).

requirements of policy-makers and practitioners will be limited to what they have at hand and understand.

Identified gaps and proposed S&T activities for communication and persuasion

What follows is an overview of gaps in U.S. government science and technology for communication and persuasion based on the new research areas identified above, expert interviews, and a survey of current U.S. programs (see Appendix).

Survey and validation of theories and techniques for influence in the digital realm

The foregoing has barely skimmed the surface of research on influence in digital environments. The U.S. government would benefit from a survey of the latest theories and techniques of online influence in digital environments, particularly in the areas of interactive technology, persuasive technology (particularly mobile phone applications), immersive virtual environments, and simulation games. The survey should remark on the extent to which each theory and technique has been validated, using quantitative methods.

This survey might be followed by basic research to test the unvalidated theories it has identified and by investing in new research on influence in computer-mediated communication. The research should be cross-disciplinary and look at a variety of digital platforms.

The results of the survey and the subsequent research might be integrated in the government's training for its public affairs professionals, influence specialists, and analysts.

Target audience analysis, trend monitoring, and source criticism

Because the subject was treated in RRTO's 2009 report on S&T, the foregoing has not focused on using digital technology for target audience analysis and trend monitoring.

Nevertheless, these areas need far more investment and attention. The Internet in general and social media in particular can complement and in some instances replace other sensors of audience opinion and behavior, such as polls, focus groups, and Nielsen ratings. Data derived online are cheaper, more timely, more scalable, and in many ways more nuanced and detailed. Even if we poorly understand how to influence populations, the data gathered online can serve as an early warning of growing trends to which the U.S. government will need to respond. Areas that require immediate attention include audience segmentation derived from unstructured data and determining the extent to which online opinion research meshes with similar research in the physical world, particularly in authoritarian countries. Another area that requires attention is the use of online data to identify the biases and interests of sources of information. Minerva's "Real-Time Contextual Mapping and Visualization Dashboard for Muslim Social Movements" (see Appendix) is one example of how such data might be gathered and represented.

Online measures of effectiveness

Experts consulted for this report agree that the measures of effectiveness for communication and persuasion are abysmal—whether inside or outside government, digital or not. Most measures that are touted as showing the influence of a campaign have to do with performance rather than effectiveness. The U.S. government might invest in research on ways to use the Internet to measure the effectiveness of messaging campaigns online and in the physical world. Since each technology has metrics specific to it, the research agenda is expansive. The metrics for measuring effectiveness on Facebook, Twitter, and blogs are better developed in the academic literature and the private sector than the metrics for other forms of social media (such as discussion boards) and persuasive technologies, which have attracted less academic or private industry interest. For example, how does one measure effectiveness by means of mobile platforms?

Training in techniques of communication and persuasion in the digital realm

The fruits of research on science and technology for communication and persuasion need to be incorporated into training courses for public affairs professionals, influence specialists, and analysts. Funding for the development of curricula and training modules should receive at least as much emphasis as investment in new technology. Private industry is already investing in new technology; for the U.S. government, it is a matter of learning to use this technology effectively and deploying the latest techniques in online persuasion and research. If such training is not taking place at the Defense schools or the

Foreign Service Institute, the U.S. government might make it part of the curriculum or create an independent schoolhouse. Such training might include parsing open source data for audience analysis; techniques for online persuasion and engagement; using social media for problem solving; and incorporating new communication and persuasion technologies and techniques in executive-level decision making.

Immersive virtual environments and simulation games for non-military purposes

The U.S. government is already ahead of many in private enterprise in developing and using immersive virtual environments and simulation games, particularly in the military. The military might find ways to refashion these platforms for working with non-military partners and messaging to key audiences—for example, training NGOs to better work with U.S. agencies in the immediate aftermath of disasters.

Persuasive technology on mobile devices for encouraging positive behavior

Persuasive technology is a growth industry, especially for mobile devices. Its success in encouraging healthy lifestyles suggests that it could be used to promote other positive behaviors in individuals and communities. Since its application in areas of interest to the U.S. government, such as conflict resolution, is nascent, the U.S. government might use its considerable experience in creating persuasive technology for military recruitment to experiment with its utility in encouraging positive behavior in other sectors and societies.

Crowdsourcing for problem solving and accountability

Over the last few years, activists and entrepreneurs have used social media to pool the collective wisdom of its users to arrive at solutions for everything from government corruption, to traffic congestion, to designs for t-shirts. The use of this sort of technology—i.e., “crowdsourcing”—and research on its effectiveness, particularly in unstable states and conflict zones, could enhance a number of government programs and public-private partnerships. One area of exploration might be creating, managing, and participating in ad hoc communities of interest for everything from crisis management to messaging after large terrorist attacks. Another area of research is techniques and technologies for empowering others to advance U.S. interests without government interference.

Studying adversary use of social media

Militant groups—from al-Qaeda and the Taliban, to state actors such as Iran's Revolutionary Guards—are using social media to monitor and influence public opinion. But most academic research on social media is confined to peaceful groups and institutions, and does not always translate well into understanding how the United States' adversaries are using newer technology to advance their objectives. The U.S. government might invest in cross-disciplinary studies on the ways militant groups use social media to advance their causes.

Technology for promoting freedom under repressive regimes

There is a debate about whether some technologies are inherently democratizing and beneficial and, consequently, whether the United States should be providing them to the public. For example, the U.S. Navy developed "Tor," a free technology that allows users to browse online anonymously. The U.S. State Department has promoted the technology abroad to assist people living under repressive regimes. However, the technology is frequently criticized by anti-piracy advocates, who argue that it is often used to mask criminal activity. The U.S. government might fund research into which technologies further its national security and human rights interests and how those technologies are best deployed to maximize their desired positive effect and minimize their harm.

Expanding investment in emerging technologies

Through institutions like In-Q-Tel and in-house innovation offices like DARPA and IARPA, the U.S. government is already investing in new technologies for communication and persuasion. For example, IARPA's "Babel Program" (see Appendix) is developing speech recognition technology to improve speech transcription for languages other than English, making it easier to search. The government might consider expanding the remit of these institutions to invest in research and development for communication and persuasion technology. To ensure that these technologies are understood and used by its employees, the U.S. government might also encourage collaboration between its communicators and the technologists at its in-house innovation offices, who can help each other identify technological gaps and use off-the-shelf technologies to meet U.S. objectives abroad

Although these development, research, and training gaps have been listed separately, they are interdependent, as are the three technologies highlighted above: social interaction technology, persuasive technology, and immersive virtual environments and simulation games. Indeed, as the technologies converge on one another, it will become more difficult to speak of different domains of technological research and development for communication and persuasion. Persuasive technologies will incorporate social interaction technologies, virtual environments will borrow the techniques of persuasive technologies, and so forth.

Despite the focus of this report on technology for communication and persuasion, such technology will only succeed in advancing U.S. interests if it serves well-informed policies; if the senior makers of those policies use and understand the technologies themselves; and if the practitioners carrying out those policies remember that putting a human face on an institution's words and actions and establishing positive relationships—on and offline—with people working toward shared goals matter more than the substance of any particular message. Ironically, digital technology is making this human connection more possible now than at any time in the modern era.

Appendix: Survey of Current Programs

C	Collaboration	<i>Increasing collaboration and training across and beyond Government</i>
D	Discourse	<i>Analysis of radical and counter-radical messages and ideas</i>
F	First Three Feet	<i>Empowering, Equipping, Educating, and Encouraging media and others to exist and freely report on events for what they really are</i>
I	Infrastructure	<i>Enabling and facilitating access to information from news to markets to vocational</i>
M	Modeling and Forecasting	<i>Gaming and anticipating adversarial messages, ideas, and activities and our counters and pre-emptives</i>
P	Psych Defense	<i>Planning and capacity building for dealing with critical strains in society in peacetime and wartime</i>
S	Social Media	<i>Knowledge Management, Social Media, and Virtual Worlds</i>
U	Understanding	<i>Develop country, culture, and regional expertise, including polling</i>

Categories and descriptions are drawn from 2009 RRTO report on "Strategic Communication Science and Technology Plan."

	Project Name	Description	Execution Agent
C	Return on Investment Analytic Framework for COCOM VOICE Operations	The contractor shall develop one or more Return on Investment Analytic Frameworks for the COCOM Voice Operations. These frameworks shall provide measurements of performance, measurements of effectiveness, and methods of determining overall return on investment of program dollars. Deliverables include: 1) an analysis plan; 2) development of a semi-structured instrument to assist in Stakeholder interviews; 3) a summary report with a literature review; a final report / final analysis frameworks/scorecards; and 4) development of a training manual and slide presentation detailing the application of its ROI framework(s).	ASD(SO/LIC)-CTTSO
C	Population Research and Analysis Planning Support to Military Information Support Operations	The contractor shall design and execute a graduated research training course for the Department of Defense designed to be taught in an incremental fashion, over an extended period of time. As many as six courses of training are desired to teach advanced, senior, and (as an option) master approaches to the methodological design and interpretation of public opinion polling, focus groups, in-depth interviews, media analysis and general analytical concepts associated with evaluation. Additionally, the courses shall highlight examples of the types of situations where each approach is most useful.	ASD(SO/LIC)-CTTSO

C	Tanzania Terror Conference	Four day conference to bring African Partners to discuss and cross-talk about CVEI initiatives and problems	USAFRICOM
C	Embassy Dhaka Countering Violent Extremism Conference	The conference's objective is to discuss and identify Countering Violent Extremism strategic communication objectives for counter-radicalization. Mission Dhaka requests action posts to nominate host nation participants for the conference. Each delegation will present a case study on the counter-radicalization methods, policies and programs used in their respective country. The United States' Combating Terrorism Fellowship Program (CTFP) is fully sponsoring seventy-five participants from Bangladesh, India, Maldives, Nepal, Sri Lanka, and Thailand to participate in this conference.	AMEMB Dhaka OASD-SOLIC CTFP
C	Multi-lateral Planners Conference VII	This conference is co-sponsored by JS J5 and the Australian Defense Force. The conference will contain a series of four break-out sessions, focused on CVE, Addressing Resources Scarcity, Examining the Role of Multi-national Institutions, and Addressing the New Global Commons.	Joint Staff J5, Australian Defense Force
D	RED BEARD	Translation and exploitation of AQA internal correspondence for use by US and foreign nation CT forces; Counter AQA propaganda	USSOCOM

D	Metaphor Program	The Metaphor Program will exploit the fact that metaphors are pervasive in everyday talk and reveal the underlying beliefs and worldviews of members of a culture. In the first phase of the two-phase program, performers will develop automated tools and techniques for recognizing, defining and categorizing linguistic metaphors associated with target concepts and found in large amounts of native language text. The resulting conceptual metaphors will be validated using empirical social science methods. In the second phase, the program will characterize differing cultural perspectives associated with case studies of the types of interest to the Intelligence Community. Performers will apply the methodology established in the first phase and will identify the conceptual metaphors used by the various protagonists, organizing and structuring them to reveal the contrastive stances.	IARPA
F	Leaders of Influence - Maldives	This is a counter-radicalization series of seminars, workshops, and discussions facilitated by the Asia Foundation, incorporating religious and secular leaders in the Maldives to advocate moderate religious messages tolerance of dissenting views and non-violent expressions of faith. The series will also serve to discredit violent extremist ideology. Additionally, the series will establish a network of new key communicators and contacts for future programs.	USSOCOM

1	Public Command Message Translation Website	<p>The USPACOM website and public pages to include selected third party media content translated, culturally optimized, and updated daily in the languages of Japanese, Chinese (Mandarin), Indonesian (Bahasa), Korean, Indian (Hindu), Vietnamese, Mongolian and Thai.</p> <p>This capability provides blogging and interactive, public communication capabilities utilizing existing social media and network sites like Facebook, Flickr, and Twitter or other regional web applications.</p>	USPACOM
1	Trans Regional Web Initiative (TRWI) - Multiple / Worldwide	USSOCOM develops a centrally-managed website architecture within which participating COCOM websites tailored to foreign audiences can operate in order to amplify their trans-regional impact, achieve cost efficiencies and enhance quality.	USSOCOM
1	Center for Strategic Counterterrorism Communications (CSCC)	An Executive Order established the CSCC in FY 11. The goal of the interagency center is synchronizing the USG's CT and CVE communications.	DOS

I	Real-Time Contextual Mapping and Visualization Dashboard for Muslim Social Movements	A web portal that provides access to a broad range of information. This will include a database that tracks both radical and counter-radical networks of ideas and actors. The web portal's dashboard will graphically map the diffusion and influence, geographically and diachronically, of these ideas and actors. The dashboard will feature the ability to search and return results which include descriptive information about and classification of the search terms and constructs; a visual representation of where along multiple spectrums any particular group lies at a defined period of time based on the project's analysis of multi-faceted cross-regional and cross-disciplinary data using theoretically driven non-binary models which capture the complexity of the material; the ability to track peaking religious, political, socioeconomic markers driving Muslim social movements, their target demographics, and locations.	ASD(R&E)-Minerva
I	Babel Program	The Babel Program will develop agile and robust speech recognition technology that can be rapidly applied to any human language in order to provide effective search capability for analysts to efficiently process massive amounts of real-world recorded speech. Today's transcription systems are built on technology that was originally developed for English, with markedly lower performance on non-English languages. These systems have often taken years to develop and cover only a small subset of the languages of the	IARPA

		world. Babel intends to demonstrate the ability to generate a speech transcription system for any new language within one week to support keyword search performance for effective triage of massive amounts of speech recorded in challenging real-world situations.	
M	Influencing Violent Extremist Organizations Update	The objective of the I-VEO project was to gain a holistic understanding of intended and unintended effects of Influencing Violent Extremist Organizations (IVEO) that can be transferred to a usable analytic framework that informed decision-makers and planners. The resulting holistic analyses derived analytic confidence from the examination of sound theoretical knowledge, conceptual modeling, and testing in historical cases. The results of this study aided the Joint Staff and COCOMs at strategic and operational levels by providing a conceptual framework grounded in scientifically-sound theoretical concepts and analyses.	ASD(R&E)-Strategic Multilayer Assessment
M	Early Warning, Analysis and Targeting for Hotspot Identification, Tracking and Intervention	Sandia National Laboratories will pilot the use of its suite of graph, text, and web analytics to identify locations, websites, groups and individuals where social mobilization and flare ups are most likely to occur. Primarily using open-source information from the web, Sandia will identify and map relevant social and information networks, determine their virulence and effectiveness, map current influence flows and effects, and identify opportunities and candidate means for	ASD(R&E)-Rapid Reaction Technology Office, USPACOM, SOCPAC

		positive change.	
M	Sirius Program	The goal of the Sirius Program is to create experimental Serious Games to train participants and measure their proficiency in recognizing and mitigating the cognitive biases that commonly affect all types of intelligence analysis. The research objective is to experimentally manipulate variables in Serious Games and to determine whether and how such variables might enable player-participant recognition and persistent mitigation of cognitive biases. The Program will provide a basis for experimental repeatability and independent validation of effects, and identify critical elements of design for effective analytic training in Serious Games. The cognitive biases of interest that will be examined include: (1) Confirmation Bias, (2) Fundamental Attribution Error, (3) Bias Blind Spot, (4) Anchoring Bias, (5) Representativeness Bias, and (6) Projection Bias.	IARPA
P	IO Subject Matter Expert Exchange - Mexico	IO subject matter expert Exchange requested by SEDENA and SEMAR (Mexican Military) to provide information about Information Operations in general and certain IO capabilities within stated Mexican military capabilities in September 2011	USNORTHCOM
S	Knowledge Management Cell	Provides timely and relevant cultural advisement to USCENTCOM on-going planning efforts and current events. Maintains a Common Operating Picture with database for IO related	USCENTCOM

		operations, actions, and activities	
S	Social Media in Strategic Communication	<p>The general goal of the Social Media in Strategic Communication (SMISC) program is to develop a new science of social networks built on an emerging technology base. In particular, SMISC will develop automated and semi-automated operator support tools and techniques for the systematic and methodical use of social media at data scale and in a timely fashion to accomplish four specific program goals:</p> <ol style="list-style-type: none"> 1. Detect, classify, measure and track the (a) formation, development and spread of ideas and concepts (memes), and (b) purposeful or deceptive messaging and misinformation. 2. Recognize persuasion campaign structures and influence operations across social media sites and communities. 3. Identify participants and intent, and measure effects of persuasion campaigns. 4. Counter messaging of detected adversary influence operations. 	DARPA
U	Global Assessment Program (GAP)	<p>The Global Assessment Program (GAP) supports Military Information Support Operations (MISO) products for USSOCOM and the Geographic Combatant Commands in Overseas Contingency Operations. The program:</p> <ul style="list-style-type: none"> * Plans, develops, organizes, coordinates and analyzes relevant qualitative research, statistically reliable and valid quantitative research, and testing and polling activities at the local, provincial, national, and regional levels based upon USSOCOM 	USSOCOM

		<p>designated objectives.</p> <ul style="list-style-type: none"> * Annually, collects geo-located data, both qualitative and quantitative, that relates to the performance and effects of existing influence activities in each country specified by the Government. Sample sizes shall be sufficiently large enough to enable the Government to use the province as the smallest unit of analysis. * Applies current research and socio-cultural explanations of radicalization and violent extremism to understand the effectiveness of human influence, media communications and engagement operations and activities in achieving United States Government and Department of Defense (DoD) objectives. * Determines the population's sympathy/antipathy for al-Qaida (AQ) and its allies' methods and rationales for radicalization, recruitment and propensity for violence at the provincial level (or country equivalent); as well as, assesses and defines the reasons for their sympathy/antipathy and their valid human factors influence requirements. * Uses time-series analyses, predictive modeling, and statistical matching techniques (e.g., propensity scoring) and geospatial analysis to discern the impact of military information support operations program initiatives. * Assesses the efficacy of influence programs delivered using a variety of media including printed materials, web-based content, television and radio. * Using a combination of qualitative 	
--	--	--	--

		and quantitative methodologies, assesses the effectiveness and synchronization of content across trans-regional products covering each Geographic Combatant Command's area of responsibility. * Assesses the effectiveness of regionally and trans-regionally oriented web-based influence programs. Assessments of content synchronization and effectiveness shall be conducted annually for each website and/or web-based initiative.	
U	Internet Service	Translation of local and satellite news to analyze USCENTCOM Iraq area of operations events, and provided advice to the J33 IO	USCENTCOM
U	Focus Group and Polling	Polling is conducted for long term trends and analysis of the environment. Focus Groups are conducted to pretest brand products, significant changes in the environment, and other cultural or topical issues.	USCENTCOM
U	Baseline Assessment of MISO Effects in Mexico	Develop initial Mexico information environment baseline. Identify influence control factors to apply MISO effects. Understand threat actors in area of operations, C-Trans-National Crime Organization and counter-terrorism. Understand the use of social media and monitor influence and effects on threat, government, population, and green forces.	USSOUTHCOM

U	OPERATION Reliant Voice Assessment	Manage Operation RELIANT VOICE (ORV) influence assessment effort. Intent is to synchronize all ORV assessment processes; augmented with assessment subject matter experts to deliver an integrated, efficient and effective report detailing execution and impact of all ORV operations, activities, and actions.	USPACOM
U	Research and Analysis of Nepal Security Environment	Determine factors in Nepal that contribute to a fragile security environment and how SOCPAC can influence those factors in future operations	USPACOM
U	Vulnerable Population Study (VPS)	A series of targeted/random assessments to identify USSOCOM (VPS) population groups vulnerable to religious radicalization, extremist recruitment and illicit activities (smuggling, piracy, trafficking) in order to develop information on potential target audiences for future MIST-BG programs, and gauge changes in perception over time.	USSOCOM
U	Gather Information - Thailand	The MIST will employ independent contractors, through the Open Source Center, for the collection of information on past and current MISO programs, violent extremist ideology messaging, and atmospherics of the operating environment.	USSOCOM

U	Designing a Qualitative Data Collection Strategy for Africa	The Institute for Defense Analyses will survey the qualitative data requirements among USG designers and users of computational models relating to Africa. In addition to interviews with individual stakeholders, IDA will convene a workshop of the USG modeling and simulation community to identify existing tools, models, and simulations currently being used to inform analyses of the African continent; data categories, fields, and other types of data currently collected; sources of existing qualitative data; sampling methodologies; gaps in qualitative data; and evaluate the quality of data currently collected and gauge interest/need to validate data. IDA will then work closely with the sponsor, other USG stakeholders, and key regional participants and partner institutions to develop a qualitative data collection strategy.	ASD(R&E)-Rapid Reaction Technology Office
U	Open Source Indicators	Many significant societal events are preceded and/or followed by population-level changes in communication, consumption, and movement. Some of these changes may be indirectly observable from publicly available data, such as web search queries, blogs, micro-blogs, internet traffic, financial markets, traffic webcams, Wikipedia edits, and many others. Published research has found that some of these data sources are individually useful in the early detection of events such as disease outbreaks. But few methods have been developed for anticipating or detecting	IARPA

		<p>unexpected events by fusing publicly available data of multiple types from multiple sources. IARPA's Open Source Indicators (OSI) Program aims to fill this gap by developing methods for continuous, automated analysis of publicly available data in order to anticipate and/or detect significant societal events, such as political crises, humanitarian crises, mass violence, riots, mass migrations, disease outbreaks, economic instability, resource shortages, and responses to natural disasters. Performers will be evaluated on the basis of warnings that they deliver about real-world events.</p>	
--	--	--	--